

The Periodic Table

<i>IA</i> H 1 1.01																	<i>VIIIA</i> He 2 4.00		
<i>IIA</i> Li 3 6.94	<i>IIA</i> Be 4 9.01											<i>IIIA</i> B 5 10.81	<i>IVA</i> C 6 12.01	<i>VA</i> N 7 14.01	<i>VIA</i> O 8 16.00	<i>VIIA</i> F 9 19.00	<i>VIIA</i> Ne 10 20.18		
Na 11 22.99	Mg 12 24.31			<i>IIIB</i>	<i>IVB</i>	<i>VB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>IB</i>	<i>IIB</i>	Al 13 26.98	Si 14 28.09	P 15 30.97	S 16 32.07	Cl 17 35.45	Ar 18 39.95
K 19 39.10	Ca 20 40.08	Sc 21 44.96	Ti 22 47.88	V 23 50.94	Cr 24 52.00	Mn 25 54.94	Fe 26 55.85	Co 27 58.93	Ni 28 58.69	Cu 29 63.55	Zn 30 65.39	Ga 31 69.72	Ge 32 72.61	As 33 74.92	Se 34 78.96	Br 35 79.90	Kr 36 83.80		
Rb 37 85.47	Sr 38 87.62	Y 39 88.91	Zr 40 91.22	Nb 41 92.91	Mo 42 95.94	Tc 43 (97.9)	Ru 44 101.07	Rh 45 102.93	Pd 46 106.42	Ag 47 107.87	Cd 48 112.41	In 49 114.82	Sn 50 118.71	Sb 51 121.76	Te 52 127.60	I 53 126.90	Xe 54 131.29		
Cs 55 132.91	Ba 56 137.33	La 57 138.91	Hf 72 178.49	Ta 73 180.95	W 74 183.85	Re 75 186.21	Os 76 190.2	Ir 77 192.22	Pt 78 195.08	Au 79 197.97	Hg 80 200.59	Tl 81 204.38	Pb 82 207.2	Bi 83 208.98	Po 84 (209)	At 85 (210)	Rn 86 (222)		
Fr 87 223.02	Ra 88 226.03	Ac 89 227.03	Rf 104 (261)	Db 105 (262)	Sg 106 (263)	Bh 107 (262)	Hs 108 (265)	Mt 109 (266)											

Ce 58 140.12	Pr 59 140.91	Nd 60 144.24	Pm 61 (145)	Sm 62 150.36	Eu 63 152.97	Gd 64 157.25	Tb 65 158.93	Dy 66 162.50	Ho 67 164.93	Er 68 167.26	Tm 69 168.93	Yb 70 173.04	Lu 71 174.97
Th 90 232.04	Pa 91 231.04	U 92 238.03	Np 93 237.05	Pu 94 (240)	Am 95 243.06	Cm 96 (247)	Bk 97 (248)	Cf 98 (251)	Es 99 252.08	Fm 100 257.10	Md 101 (257)	No 102 259.10	Lr 103 262.11

Solubility Guidelines:

Soluble Ionic Compounds	
1.	All sodium, potassium and ammonium salts are soluble.
2.	All nitrate, acetate, chlorate and perchlorate salts are soluble
3.	All chloride, bromide and iodide salts are soluble. Except those that contain: lead, silver or mercury(I) (Hg_2^{2+}).
4.	All fluoride salts are soluble. Except those that contain: magnesium, calcium, strontium, barium or lead.
5.	All sulfate salts are soluble. Except those that contain: calcium, silver, mercury(I), strontium, barium or lead.
Not Soluble Ionic Compounds	
1.	All hydroxide and oxide salts are not soluble. Except those that contain: sodium, potassium or barium.
2.	All sulfide salts are not soluble. Except those that contain: sodium, potassium ammonium or barium.
3.	All carbonate and phosphate salts are not soluble. Except those that contain: sodium, potassium or ammonium.

$$[H_3O^+] = [Acid]$$

$$[H_3O^+] = \sqrt{K_a[Acid]}$$

$$[H_3O^+] = K_a \frac{[Acid]}{[Base]}$$

$$[H_3O^+][OH^-] = 1 \times 10^{-14}$$

$$pH = -\log_{10}[H_3O^+]$$

$$pOH = -\log_{10}[OH^-]$$

$$pK_a = -\log_{10}K_a$$

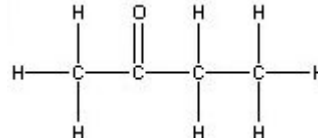
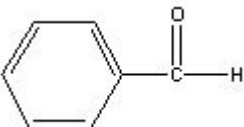
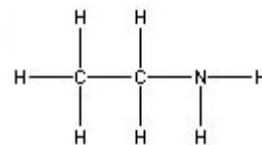
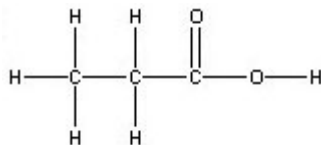
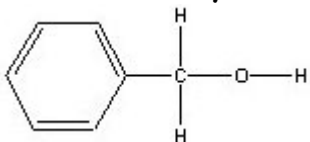
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Last: _____ First: _____

Question 1
5 Points

Classify each of the following structural formulae as a(n) **amine**, **ketone**, **carboxylic acid**, **alcohol** or **aldehyde**.



Do Not Write Here

Question 2
6 Points

Match the **compound** on the right with the **functional group** classification on the left.

- | | | | | | |
|--------------------|-------|--------------------------------------|-------------|-------|--|
| 1. alcohol | _____ | $\text{CH}_3\text{OCH}_2\text{CH}_3$ | 4. aldehyde | _____ | $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ |
| 2. carboxylic acid | _____ | $\text{CH}_3\text{CH}_2\text{NH}_2$ | 5. ketone | _____ | $\text{CH}_3\text{CH}_2\text{COOH}$ |
| 3. amine | _____ | CH_3CHO | 6. ether | _____ | $\text{CH}_3\text{COCH}_2\text{CH}_3$ |

Question 3
16 Points

What is the **electron-pair** geometry of **NOCl**? _____

There are ____ lone pair(s) around the central atom, so the geometry of **NOCl** is _____. The bond angle about the central **nitrogen** atom is _____.

What is the **electron-pair** geometry of **H₂S**? _____

There are ____ lone pair(s) around the central atom, so the geometry of **H₂S** is _____. The bond angle about the central **sulfur** atom is _____.

Do Not Write Here

Question 4
10 Points

The molecular geometry for the following five molecules is given below. Label these molecules as either **Polar** or **Non Polar**.

- | | | |
|-----------------------------|-----------------|-------|
| 1. CF_4 | Tetrahedron | _____ |
| 2. CH_2Cl_2 | Tetrahedron | _____ |
| 3. H_2CO | Trigonal Planar | _____ |
| 4. N_2 | Linear | _____ |
| 5. HCN | Linear | _____ |

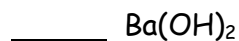
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Question 5

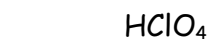
12 Points

Do Not
Write Here

Classify each of the following substances:



1. strong acid



2. weak acid



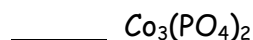
3. strong base



4. weak base



5. salt: soluble



6. salt: not soluble

Question 6

6 Points

The formula for the **conjugate base** of HBr is _____.

The formula for the **conjugate base** of NH_4^+ is _____.

Question 7

8 Points

Do Not
Write Here

The $[\text{H}^+]$ in an aqueous solution is $8.46 \times 10^{-2} \text{ M}$.

- The pH of this solution is: _____
- The $[\text{OH}^-]$ in the solution is: _____
- The pOH is: _____
- The solution is: (acidic/basic/neutral) _____

Question 8

5 Points

Do Not
Write Here

Determine the pH of an aqueous solution of 0.468 M hypochlorous acid, $\text{HClO} (\text{aq})$, $K_a = 3.5 \times 10^{-8}$.

pH: _____

Question 9

10 Points

Do Not
Write Here

A 1.00 liter buffer solution contains 0.41 M hydrofluoric acid and 0.53 M potassium fluoride.

If 0.27 moles of sodium hydroxide are added to this system, indicate whether the following will, **increase**, **decrease** or **not change**.

(Assume that the volume does not change upon the addition of sodium hydroxide.)

- The number of moles of HF will: _____
- The number of moles of F^- will: _____
- The equilibrium concentration of H_3O^+ will: _____
- The pH will: _____
- The ratio of $[\text{HF}] / [\text{F}^-]$ will: _____

SID:

Last: _____ First: _____

Question 10
7 Points

Sulfur dioxide reacts with **oxygen gas** to produce **sulfur trioxide**.

How many moles of **oxygen gas** are necessary to form **50.4g** of **sulfur trioxide**?

_____ mol

Question 11
9 Points

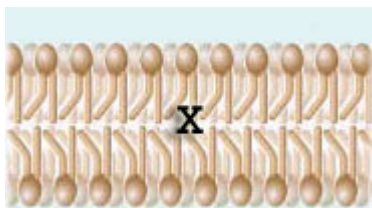
Calcium hydroxide reacts with **nitric acid** to produce **calcium nitrate** and **water**.

An aqueous solution of **calcium hydroxide** is standardized by titration with a **0.204 M** solution of **nitric acid**.

If **16.2 mL** of base are required to neutralize **12.6 mL** of the acid, what is the molarity of the **calcium hydroxide** solution?

_____ M

Question 12
6 Points



1. A membrane with a hydrophilic head group is depicted on the left; circle the **polar ends** of the membrane.

2. From the list below circle the molecule(s) that might be

X: H₂O CH₄ CH₂F₂ BF₃

